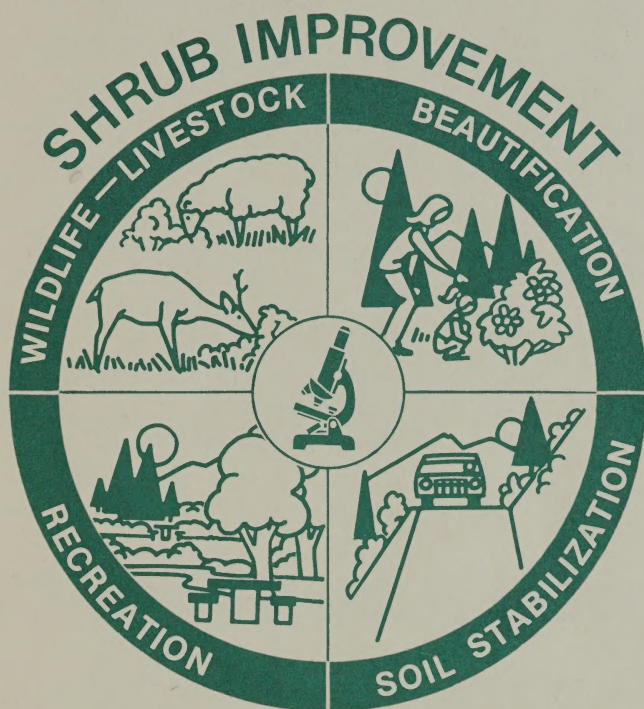


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U.S. Intermountain Forest
and Range Experiment Station

SHRUB SCIENCES LABORATORY

Maintained in Cooperation with
Brigham Young University

PHOTO, facing page:

Artist's conception of completed and landscaped
Shrub Sciences Laboratory, Provo, Utah.

Dedicated November 6, 1975.



The Shrub Sciences Laboratory

Welcome to the Intermountain Forest and Range Experiment Station's Shrub Sciences Laboratory. The Laboratory is maintained in cooperation with Brigham Young University and is located on the University's campus in Provo, Utah. This location is near the center of the 400 million acres of shrubland in the Western United States. The Rocky Mountains, Great Basin, and Colorado River Plateau are all nearby.

The Shrub Sciences Laboratory is the first facility devoted principally to wildland shrub research. With the opening in 1975 of this laboratory, study and management of our valuable shrub resources can be better coordinated.

Shrubs give the West its characteristic landscape. They grow in areas ranging from hot deserts to lofty mountain tops, and from undrained alkaline basins to acid peat bogs.

Shrubs provide year-round habitat for wildlife, forage for livestock and big game, beauty for the countryside, stability to erodible soils, and enhanced recreational opportunities. They are used for noise abatement, landscaping, and screening of campgrounds and roadways. To meet the increasing demands of our society, we must learn to manage and improve wildland shrubs through continuing research efforts.



Deer browsing.



Pocket mouse.



Brewer's sparrow.

Shrub Uses

Wildland shrubs constitute an important part of many ecosystems. Some of their contributions in natural and man-ordered environments are outlined here.

Wildlife

In winter, deer and elk migrate from high mountain ranges to foothills and lowlands. Here wildland shrubs such as sagebrush, Gambel oak, mountain-mahogany, bitterbrush, wild rose, and rabbitbrush furnish about 75 percent of the forage consumed by these animals. Consequently, the size and health of a deer or elk herd is directly related to the quantity and quality of shrubs available above winter snow.

Antelope, which inhabit plains and foothills, depend heavily on shrubs for forage in all seasons.

Small mammals such as pocket mice make their homes within or near wildland shrubs, or build homes of shrub material. Shrub parts, especially seeds, furnish sustenance for many kinds of small mammals.

Many birds are dependent on shrubs for nesting sites and food. Insects and small mammals that live and feed upon shrubs serve as sources of food for birds. The fruits and seeds of shrubs also provide food for birds.

Livestock

Wildland shrubs such as black sagebrush, bud sagebrush, big sagebrush, winterfat, and the saltbushes furnish most of the forage for many western sheep herds. By allowing sheep to range over our shrublands, valuable wool and meat are obtained. There is no direct consumption of petroleum energy for production of this meat and fiber.

Thousands of cattle range over shrub-dominated land. Their foraging on shrubs, grasses, and forbs of these lands produces thousands of pounds of meat and leather with a minimum expenditure of valuable petroleum energy and feed grains.



Sheep grazing.



Cattle on shrublands.



Shrubs in campground.



Picking wild berries.



Recreation

Wildland shrubs are valuable for improving the quality of camping and picnicking sites. As plant screens, they help provide privacy for individual sites at a single location. Wise placement of shrubs helps control traffic and protect sensitive ecological areas and provides a more esthetic environment for campers and picnickers.

Many wildland shrubs such as chokecherry, currant, elderberry, huckleberry, and sumac provide the raw materials from which many tasty jellies, jams, wines, and teas can be made.

Landscaping with native shrubs gives the homeowner the opportunity to create many interesting and beautiful backgrounds in residential areas. Shrubs also are useful in noise abatement.

Landscaping with native shrubs.



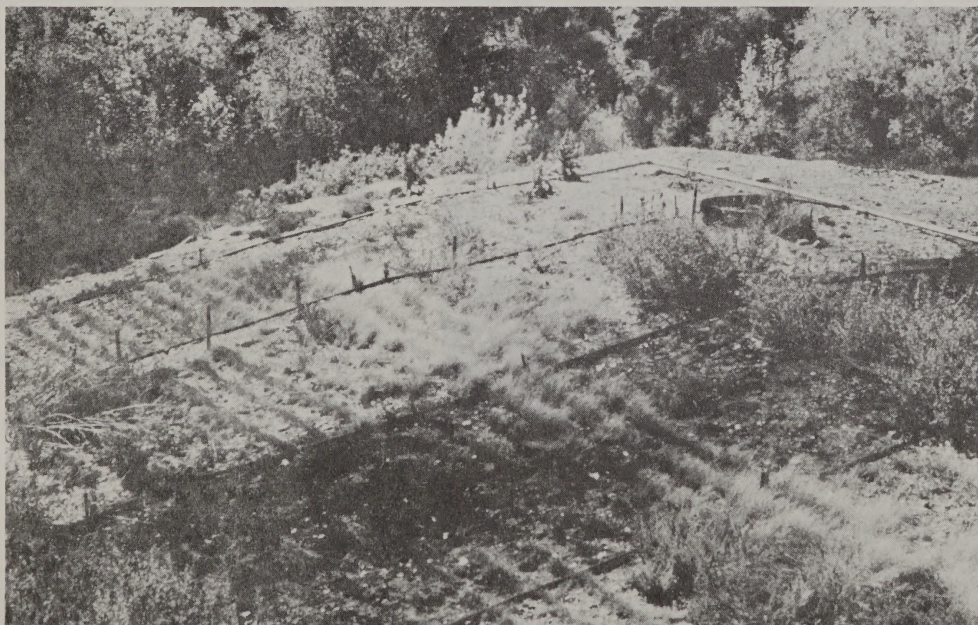
Erosion control on road cut.

Soil Stabilization

Shrubs are used to stabilize and improve the appearance of construction and roadside scars. They are valuable soil stabilizers because some are rapid growers that provide quick cover and many have deep and fibrous root systems. Shrubs occur in all western mountain watersheds and contribute to a quality water supply by controlling sedimentation.

The challenge of vegetating mine spoils is great, but it can be met by using shrubs in association with other types of plants. Many western shrubs grow naturally in mineral soils and are preadapted to mineralized spoils.

Trial plots on spent oil shale.





Grazing systems studies.



Black sagebrush community.

Shrub Improvement

Research at the Shrub Sciences Laboratory is concerned with improving wildland shrubs and making shrublands more productive to better meet society's needs. Reaching this goal requires knowledge from many scientific disciplines, including genetics, ecology, entomology, plant pathology, physiology, taxonomy, and biochemistry.

Ecology and Management

Through range management investigations, grazing programs are developed to best manipulate cover for the animals to be supported. For example, cattle grazing favors shrub increase, but sheep and deer grazing results in the dominance of grass.

Ecological life history studies of individual species such as black sagebrush and other wildland shrubs are being conducted in the laboratory and in the field. Problems being investigated include seed germination requirements, plant tolerances to soil salts and soil moisture tensions, chemical inhibitors to plant establishment, plant response to different intensities and seasons of grazing, and adaptation of plants to different environmental conditions.

Genetics and Biochemistry

Wildland shrubs include a rich array of plants. Each species is highly variable. For example, the subspecies of big sagebrush are very different in palatability to deer and livestock. Over plant generations, traits like nutritive quality can be intensified by a process of selecting as breeding material those plants with the best expression of the trait. Traits can be transferred among related plant species.

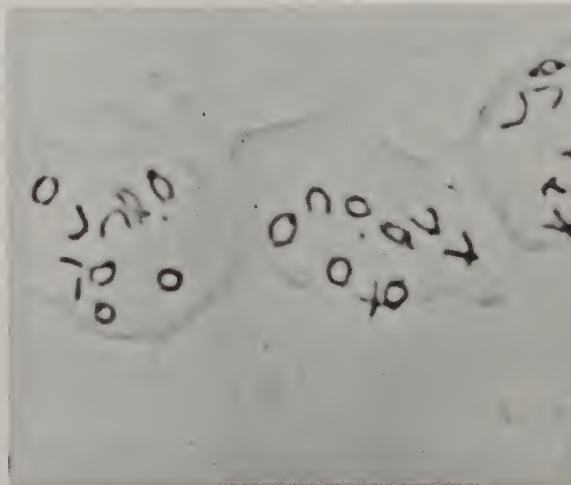
Research is underway to better understand relationships of plant species and how traits are passed on by heredity in particular species. This is done through hybridization, chromosome, and chemical studies. This research will produce shrubs that are genetically improved for particular purposes such as for deer winter ranges, roadside beautification and stabilization, and campground screens.



Deer show browsing preference.



Shrub breeding experiments.



Sagebrush chromosomes.



Western tussock moth caterpillar.



Mormon cricket.



Insect galls on sagebrush.

Entomology

To maintain wildland shrubs on livestock and big game ranges, recreation sites, and soil erosion control plots, the impact and ecological relationships of insects to the total ecosystem must be better understood. Insects such as the tussock moth have a very damaging impact on shrubs. Some insects breed and grow on shrublands, and in years of high populations migrate onto agricultural land where they destroy crops.

Insects are subjected to dry conditions that exist on large tracts of western shrublands. They have developed interesting methods of defense against dehydration. Some surround themselves with host plant tissue by forming galls. Others live in the soil and feed on plant roots.

Not all insects should be considered in negative terms. Even those that appear to be damaging shrubs may be providing food directly or indirectly for game and nongame animals. Research currently underway is concerned mainly with determining the ecological significance of insects to the wildland shrub community.

Pathology

Micro-organisms affect the health and longevity of wildland shrubs. Some of these, pathogens, cause diseases such as wilt of saltbush. Rust fungi destroy the photosynthetic tissues of host plants. This greatly reduces the plant's ability to manufacture food. Some pathogens affect their hosts by causing unsightly tumorous growths along branches and reducing plant vigor.

Some micro-organisms have good effects on shrubs; they form mutually beneficial relationships with their shrub counterparts.

Current studies are identifying plant pathogens which cause damaging diseases in shrubs. Methods to control these pathogens are also being investigated. Micro-organisms which participate in the beneficial relationships with shrubs are being isolated and identified.



Wilt of saltbush.



Rust of hawthorn.



Black knot on chokecherry.



Seed harvesting.



Aerial seeding.



Transplanting.

Shrub Establishment

Establishing shrubs so they can perform their many useful functions sometimes is difficult. Therefore, a continuing effort is underway to provide information on how to better establish shrubs on a wide range of sites.

One phase of shrub establishment research seeks methods to make seed harvesting, storage, and germination more efficient and effective to provide seed when needed. Seeding equipment and techniques have been developed by laboratory personnel and cooperators.

On some unstable or high-intensity use areas, rooted cuttings, carefully grown nursery stock, and wilding transplants are more readily established for cover than are plants seeded directly.

Woody plants are valuable in making barren camping sites more attractive, comfortable, useful, and private. Research is in progress to determine which shrubs and trees are best for these purposes and how best to establish them.

Research Units and Cooperators

Research conducted at the Shrub Sciences Laboratory is carried out by two Forest Service research work units, by a cooperating scientist of the U.S. Department of Interior's Fish and Wildlife Service, and by visiting scientists from various institutions. The research program at the Laboratory also is augmented by close cooperation with other institutions and agencies. Coordinated research is conducted at several other western facilities (map, inside back cover).

Longstanding cooperative research on improving and rehabilitating game ranges is conducted with Utah Division of Wildlife Resources personnel at the Forest Service's Great Basin Experimental Range near Ephraim, Utah. Experimental gardens where shrubs are grown for intensive study are located at Boise, Idaho; Reno, Nevada; and Provo and Ephraim, Utah. Adaptation and selection planting sites are widely distributed in the Intermountain area. Some of these gardens and adaptation plots are located on land owned or managed by cooperating agencies or private citizens.

The Shrub Improvement and Revegetation research work unit is a major multifunctional team—its personnel include specialists in genetics, physiology, ecology, range science, game management, recreation, pathology, and entomology. This unit's research assignment is to locate and develop superior shrubs through plant collection, selection, and breeding for use in rehabilitating western wildlands; to formulate prescriptions for establishing and perpetuating shrubs on a variety of sites for range and wildlife habitat improvement, rehabilitation of disturbed landscapes, and improvement of recreation areas; and to provide information on the biology and management of shrub diseases and insects.

The Salt-Desert Shrubs research work unit is devoted to the study of the ecology and management of salt-desert shrubs on ranges covering vast acreages of the West. The improvement of these ranges is dependent upon careful management of plant resources, because artificial revegetation is very difficult. The salt-desert shrub ranges occupy about 50 million acres, mainly in the Great Basin of Utah

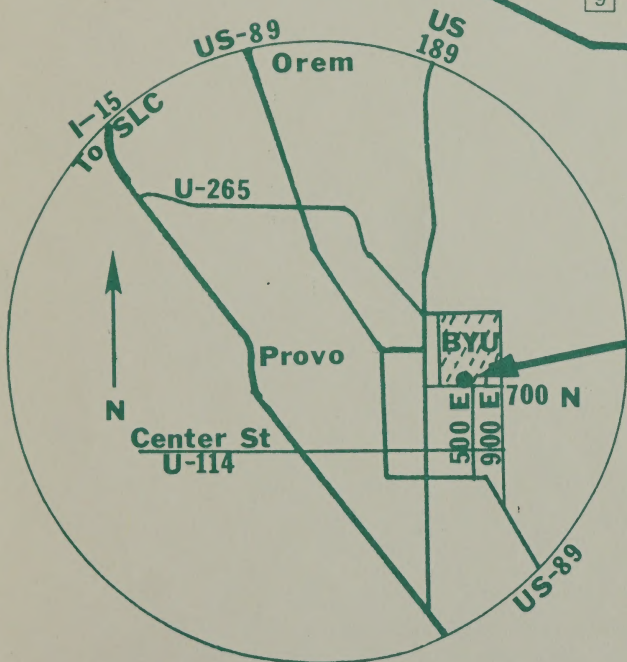
and Nevada, but also in other States and other physiographic provinces. The 55,000-acre Desert Experimental Range approximately 50 miles west of Milford, Utah, was established in 1933 for research on desert shrub ranges. Ecological and grazing system studies continue there. The Desert Experimental Range is also the location of cooperative studies on antelope herd productivity with the Utah Division of Wildlife Resources, and total plant ecology with the International Biological Program's Desert Biome. The Fish and Wildlife Service scientist is studying the small mammal and bird inhabitants of western shrublands.

Map Key

- Shrub Sciences Laboratory
- Intermountain Forest and Range
Experiment Station Headquarters
- ① Great Basin Experimental Range
- ② Desert Experimental Range

LOCATIONS OF MAJOR COOPERATORS:

- 3 Pullman, Washington
- 4 La Grande, Oregon
- 5 Coeur d'Alene, Idaho
- 6 Boise, Idaho
- 7 Reno, Nevada
- 8 Riverside, California
- 9 Tucson, Arizona
- 10 Albuquerque, New Mexico
- 11 Fort Collins, Colorado
- 12 Bridger, Montana
- 13 Missoula, Montana
- 14 Logan, Utah



SHRUB SCIENCES LABORATORY

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Forest Service
U.S. Department of Agriculture
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